CLAIMS

1. An apparatus for an integrated process of magnetic particles comprising; a drawing/discharging device for drawing and discharging a fluid, plural nozzles for passing the fluid therethrough while drawing and discharging, and a magnetic force device for applying and removing a magnetic field to and from the nozzles respectively with remaining stationary near each nozzle exterior.

2. An apparatus for an integrated process of magnetic particles according to Claim 1, wherein said magnetic force device can apply and remove the magnetic force to and from said nozzles respectively by enabling magnetization and demagnetization in a nozzle outer member brought in contact with or being near the outer surface of said nozzle or at least a part of said nozzle, with remaining stationary near each nozzle exterior.

3. An apparatus for an integrated process of magnetic particles according to Claim 2, wherein said magnetic force device comprises a magnetic member made of a magnetic material and provided with a plurality of through sections capable of taking insertion of nozzles, wherein said nozzle outer member is a wall of said through sections.

4. An apparatus for an integrated process of magnetic particles according to Claim 2 or Claim 3, wherein said nozzle outer member or a part of said nozzle comprises divided parts that are divided in two, wherein the divided parts are apart from one another in a manner that the divided parts have mutually opposite magnetic polarities.

5. An apparatus for an integrated process of magnetic particles according to Claim 4, wherein said magnetic force device comprises a magnetic source having an electromagnet or a permanent magnet, two magnetic plates made of magnetic material and connecting with the electromagnet or capable of connecting with the permanent magnet and capable of being magnetized and demagnetized, and mounted in face-to-face relationship in a low and a high position, plural through

sections penetrating the two magnetic plates and capable of taking insertion of the nozzles, a pair of projections mounted in each through section, projecting to the opposite surface of each magnetic plate and made of magnetic materials, wherein the pair of the projections correspond to the nozzle outer member, and each projection corresponds to the divided parts and are apart from one another in such a manner that they have mutually opposite polarities by magnetization.

6. An apparatus for an integrated process of magnetic particles according to Claim 5, wherein said through section comprises through holes penetrating through the magnetic plates and projecting vertically and capable of taking insertion therethrough by the nozzles, and each wall part of the mutually separated through holes has opposite polarity respectively.

7. An apparatus for an integrated process of magnetic particles according to Claim 5, wherein said magnetic force device comprises one or more magnetic sources, said magnetic source comprises a coil and a magnetic element provided with the coil, and one end of said magnetic element is connected with one of the two magnetic plates and the other end thereof is connected with the other thereof.

8. An apparatus for an integrated process of magnetic particles according to Claim 7, wherein said magnetic elements are mounted outside of the space which is formed by the magnetic plates.

9. An apparatus for an integrated process of magnetic particles according to Claim 8, wherein said magnetic elements comprise a first part and a second part which are separately mounted, wherein one end of the first part connects with one of the two magnetic plates, the other end of the second part connects with the other magnetic plate, wherein the first part and the second part are overlapped and are wound by wire of a coil, or the other end of the first part and one part of the second part are connected with each end of the third part and wound by wire of the coil and made of magnetic material.

10. An apparatus for an integrated process of magnetic particles according to Claim 4, wherein divided parts being apart from one another, are tapered toward a

gap.

11. An apparatus for an integrated process of magnetic particles according to Claim 5, wherein said pair of projections project from the opening edge of the through section of one of the magnetic plates to the other magnetic plate in a direction of insertion of the nozzle opposite to one another, and each tip of the projections is apart from the opposite surface at a first interval, and the tips of the projections are apart from one another separated from the nozzle at a second interval shorter than the first interval, in such a manner that the tips have opposite polarities, respectively.

12. An apparatus for an integrated process of magnetic particles according to Claim 3, wherein each through section of said magnetic force device comprises a separate hole in which the nozzle is inserted in a way that the outer surface of the nozzle can come in contact with or approach to the nozzle outer member, and an insert-withdraw hole mounted adjacent to the separate hole and having an opening larger than that of the separate hole so that the nozzle can horizontally move to and from the separate hole and can be withdrawn and inserted at the insert-withdraw hole.

13. An apparatus for an integrated process of magnetic particles according to Claim 12, wherein said nozzle comprises a small diameter section and a larger diameter section, said separate hole has an opening that only the small diameter section can be inserted in, and said insert-withdraw hole has an opening that the larger diameter section can be inserted in.

14. An apparatus for an integrated process of magnetic particles according to Claim 1, wherein said magnetic force device can apply and remove the magnetic force to and from the nozzle with remaining stationary near each nozzle exterior.

15. An apparatus for an integrated process of magnetic particles according to Claim 1, wherein said magnetic force device comprises an insulating device for preventing heat generated by magnetization or generation of a magnetic field, from being transmitted toward the nozzle.

16. An apparatus for an integrated process of magnetic particles according to Claim 15, comprising a ventilator for sending air to the magnetic force device or the neighborhood thereof.

17. An apparatus for an integrated process of magnetic particles according to Claim 2, wherein said magnetic force device comprises plural magnetic sources, and plural segments defined so as to include the area spatially near each magnetic source, respectively.

18. An apparatus for an integrated process of magnetic particles according to Claim 3, wherein said magnetic force device comprises a magnetic source having a permanent magnet or an electromagnet, and a plank-like member made of magnetic material and magnetically connected to the electromagnet or capable of magnetically connecting to the permanent magnet, wherein the through sections are provided in the plank-like member and are capable of taking insertion of the nozzles.

19. An apparatus for an integrated process of magnetic particles according to Claim 18, wherein the through holes of the magnetic force device comprise divided wall parts divided in the direction of the insertion of the nozzle in such a manner that divided wall parts are apart from one another and have opposite polarities by magnetization.

20. An apparatus for an integrated process of magnetic particles according to Claim 19, wherein the nozzles comprise a larger diameter section and a small diameter section, and the plank-like member of the magnetic force device comprises plural column-like members arranged apart from each other at intervals capable of taking insertion of the larger diameter section of the nozzle, and plural protrusions made of magnetic material that are projected oppositely from each column-like member, magnetized in a manner that has opposite polarity to each other and arranged apart from each other at intervals capable of taking insertion of the smaller diameter section of the nozzle, and are arranged along the column-like member at intervals capable of taking insertion of the larger diameter section of the nozzle, wherein opposite pointed ends of the protrusions correspond with the divided

wall parts.

21. An apparatus for an integrated process of magnetic particles according to Claim 2, wherein said magnetic force device comprises a plank-like member made of magnetic material, plural through holes capable of passing a fluid and mounted in the plank-like member, small diameter pipes communicating with the through holes and capable of being inserted into a vessel and mounted under the through holes, wherein the through holes and the small diameter pipes serve as the nozzles.

22. An apparatus for an integrated process of magnetic particles according to Claim 1, wherein said drawing/discharging device comprises a reservoir body comprising plural reservoirs for storing a drawn fluid and communicating with the nozzles, and an increasing/decreasing device for increasing and decreasing pressure within the reservoirs and the nozzles in a manner that draws or discharges the fluid.

23. An apparatus for an integrated process of magnetic particles according to Claim 22, wherein said increasing/decreasing device comprises a sliding body capable of moving vertically to and from the reservoir body, and sliding projections projecting downward from the sliding body and capable of sliding through the nozzle in such a manner that the pressure within the reservoirs or nozzles increases or decreases.

24. An apparatus for an integrated process of magnetic particles according to Claim 23, wherein said sliding projections are formed to have a two-step structure comprising a larger diameter section capable of sliding through the reservoir formed to be pit-like, and a smaller diameter section capable of extending along the axes of the larger diameter section and sliding through the nozzle communicating with the reservoir.

25. An apparatus for an integrated process of magnetic particles according to Claim 22, wherein said nozzles comprise a tip capable of being mounted to and dismounted from the drawing/discharging device.

26. An apparatus for an integrated process of magnetic particles according to Claim 25, comprising a pushing body having pushing pipes inserted from the upper

side of the reservoirs into the reservoirs and capable of pushing the nozzles out of the reservoirs, wherein the nozzles are detachably mounted to the reservoirs while being inserted from the lower side of the reservoirs, and the increasing/decreasing device comprises a sliding body having plural sliding projections projecting downward, capable of sliding through the pushing pipe and capable of moving vertically to and from the reservoirs respectively, in a manner that the pressure within the reservoirs or nozzles can be increased or decreased.

27. An apparatus for an integrated process of magnetic particles according to Claim 25, wherein said nozzles are detachably mounted to the lower part of pit-like reservoirs and are inserted to a predetermined depth in the pit-like reservoirs, the sliding projections can slide to a depth of the installation depth of the nozzles in the reservoirs, and a projecting lip part is projected from the outer side of the nozzles exposed under the magnetic force device for mounting and dismounting, and a stroke-down plate provided with plural small hole parts with respective diameters larger than that of the nozzles and smaller than that of the lip parts is mounted between the magnetic force device and the lip parts in a way that the hole parts take insertion of the nozzles and the nozzles can be detached by moving the stroke-down plate down .

28. An apparatus for an integrated process of magnetic particles according to Claim 23, wherein an inner wall of the upper part of said reservoir is formed to be cylindrical, and that of the lower part of said reservoir is formed to be funnel-shaped and is connected with said nozzles.

29. An apparatus for an integrated process of magnetic particles according to Claim 1, wherein said magnetic force device is constructed to be able to relatively move to and from the drawing/discharging device or the nozzle.

30. An apparatus for an integrated process of magnetic particles according to Claim 22, wherein a cleaning liquid can be poured into each reservoir from the top or side of the reservoir body.

31. An apparatus for an integrated process of magnetic particles according to

Claim 1, comprising a light measuring device for receiving light from all the vessels or plural liquid containing parts simultaneously or all together and measuring the strength of the light or processing it as an image in order to measure a state of light emission.

32. An apparatus for an integrated process of magnetic particles according to Claim 31, wherein the light measuring device comprises plural receiving components mounted at places corresponding to the liquid containing parts and having the same number as that of the liquid containing part, and shading fences mounted between neighboring receiving components for preventing light entering to other than the corresponding liquid containing part.

33. A magnetic apparatus comprising, plural outer members capable of being mounted to and dismounted from a pipette device having a drawing/discharging device for drawing and discharging a liquid, and plural nozzles through the interior of which liquid passes due to the drawing and discharging, one or more vessels arranged with plural liquid containing parts, or column clusters arranged by plural columns, and capable of being brought into contact with or approaching to each outer surface of each nozzle, each liquid containing part or each column, while being mounted to the pipette device, the vessel or the column cluster, and a magnetic force device for applying a magnetic force to or removing the magnetic force from each nozzle, each liquid containing part or each column in a state with remaining stationary, by magnetizing and demagnetizing the outer members or by generating or extinguishing the magnetic field with coils which are mounted around each nozzle, each liquid containing part or each column while fitting to the pipette device, the vessel or the column cluster.

34. A magnetic apparatus according to Claim 33, wherein said magnetic force device is the magnetic force device according to any one of Claims 3 to 21 applied to the nozzles, liquid containing parts or columns.

35. An apparatus for an integrated process of magnetic particles according to any one of Claims 1 to 34, wherein plural nozzles, plural through sections, plural

reservoirs, plural sliding projections, plural hole parts, plural pushing pipes, plural liquid containing parts of the vessel, plural columns of the column cluster or plural receiving components are arranged in a plane-like state with a predetermined periodicity or a predetermined symmetry such as row-shaped, matrix-shaped, annular ring-shaped, polygonally, or radially.

36. An apparatus for an integrated process of magnetic particles comprising a reservoir body provided with plural pit-like reservoirs for storing drawn liquid arranged in a matrix, a sliding body with jutting plural sliding projections sliding through the reservoirs and capable of moving vertically to and from the reservoir body, plural nozzles attached to the lower parts of the reservoirs and capable of passing the liquid therethrough, a magnetic force device capable of magnetization and demagnetization having plural through sections in which is inserted each nozzle and having a wall part in contact with or near the outer side surface of the nozzle, with the nozzles inserted thereinto, wherein each wall part has two divided wall parts being apart from one another in such a manner that the divided wall parts have opposite polarities by magnetization, respectively.

37. An apparatus for an integrated process of magnetic particles according to any one of Claims 1 to 32, Claim 35 and Claim 36, comprising a driving mechanism for driving the drawing/discharging device to draw and discharge, a magnetic controller for controlling the magnetic force of the magnetic force device, a transfer mechanism for transferring between vessels placed outside the pipette device, and the drawing/discharging device and the magnetic force device or between the drawing/discharging device and the nozzles and the magnetic force device, and an integrated process controller for controlling an integrated process of magnetic particles by controlling at least the driving mechanism, the magnetic controller, and the transferring mechanism according to instructions.

38. An apparatus for an integrated process of magnetic particles according to Claim 37, wherein said controller controls an insulating device such as a ventilator, the pouring of cleaning liquid, a light measuring device, and data analysis, data

disposition, or data output.

39. An apparatus for an integrated process of magnetic particles according to Claim 37, wherein said controller controls either the strength, direction, or application time of the magnetic force, or magnetic patterns obtained from various combinations of strength, direction and time, according to the contents, conditions or objects of a target controlling step, the fluid, substances such as reagents, kinds, shape, quantity, combining state, or size of the magnetic particles, the pressure, the fluid velocity, the number of times of drawing/discharging, processes of transferring, agitation, cleaning, separation, removal extraction, reaction, clarification, concentration, dilution, recovery, isolation, or resuspension, external surroundings such as temperature, structure of the apparatus, materials or size of the apparatus, progress or schedule of magnetic control, degree of the residual magnetization, or instructions from the outside.

40. An apparatus for an integrated process of magnetic particles according to Claim 39, wherein said controller controls in such a manner that the direction of the magnetization controlled by the magnetic controller is alternately reversed each time the magnetization is paused by demagnetization.

41. An apparatus for an integrated process of magnetic particles according to Claim 39, wherein said magnetic controller controls in such a manner that the direction of the magnetization is reversed with a strength or a driving time corresponding to that of the non-reversed magnetization, when changing a magnetized state to a demagnetized state.

42. A method of controlling apparatus for an integrated process of magnetic particles comprising the steps of:

drawing or discharging all together a fluid to or from a vessel comprising plural liquid containing parts by a drawing/discharging device mounted in the apparatus for an integrated process according to any one of the first to thirty second aspects, or the thirty fifth to forty first aspects,

and applying the magnetic force to or removing the magnetic force from the

nozzles with remaining stationary near each nozzle exterior, by generating or extinguishing the magnetic field with magnetization and demagnetization of the nozzle outer members mounted in contact with or near the periphery of the nozzles or a part of the nozzles, or by generation or extinguishing the magnetic field with a coil wound around the periphery of each nozzle.

43. A method of controlling the apparatus for an integrated process of magnetic particles according to Claim 42 comprising further the steps of:

mixing magnetic particles and the target substances by drawing and discharging all together with the apparatus for an integrated process, to make a suspension incorporating the magnetic particles combined with the target substances in plural liquid containing parts of the vessel,

processing for separation by adhesion to the inner walls of the nozzles, elimination from the inner walls, transferring, resuspension, agitation, dissociation, extraction, reaction, clarification, concentration, dilution, recovery, isolation, or cleaning of the magnetic particles combined with the target substances by applying the magnetic force to, or removing a predetermined magnetic force from magnetic particles combined with the target substances within the nozzles, while drawing and discharging the liquid.

44. A method of controlling the apparatus for an integrated process of magnetic particles according to Claim 42 or Claim 43, further comprising a step for measuring all together light emission of the liquid accommodated in each liquid containing part and processed by the apparatus for an integrated process.

45. A method of controlling apparatus for an integrated process of magnetic particles according to Claim 43, wherein the apparatus for an integrated process for magnetic particles whose plural nozzles are arranged in a matrix is used, and the processing for the transferring step comprises a transposed moving step for moving in such a manner that rows and columns of the nozzles of the apparatus for an integrated process or the liquid containing parts of the vessel, are exchanged, or a horizontal moving step for transferring in such a manner that rows and columns are

not exchanged.

46. A method for making any combined substances in carriers by arbitrarily combining with plural elements of substances, comprising the steps of:

dispensing each liquid incorporating each element of substances into one or more groups of containing parts arranged by plural containing parts in a matrix in which the containing parts accommodating said carriers are arranged in rows or columns having a predetermined number width in a way so as to be included in said matrix, according to the structure of the specified combined substances or the utilized kinds of containing parts, and

mixing the dispensed elements of substances into the group of the containing parts accommodating the carriers, with the elements of substances arranged in rows or columns having a predetermined number width, in such a manner that row-like or column-like arrangements of the dispensed elements of substances are positioned against row-like or column-like arrangements of the elements of substances in a state of transposition or non-transposition.

47. A method for making any combined substances in carriers by arbitrarily combining with plural elements of substances according to Claim 46, when the containing parts are liquid containing parts provided in a vessel and arranged in a matrix, further comprising the steps of:

disposing the carriers in the liquid containing parts of one of said one or more vessels,

dispensing each liquid incorporating each element of substances into one or more vessels including vessels in which said carriers are disposed, in a state with rows or columns having a predetermined number width, according to the structure of the combined substances, and

mixing each liquid incorporating each element of substances and disposed in a state with rows or columns having a predetermined number width in the other one or more vessels, with the dispensed liquid incorporating the elements of substances into the vessels in which the carriers are disposed, in such a manner that row-like or

column-like arrangements of the dispensed elements of substances are positioned against row-like or column-like arrangements of the elements of substances in a state of transposition or non-transposition.

48. A method for making any combined substances in carriers by arbitrarily combining with plural elements of substances according to Claim 46, when the containing parts are plural columns arranged in a matrix and having a function for capturing carriers comprising the steps of, disposing the carriers to each column having a capturing function, dispensing each liquid incorporating each element of substances into the columns arranged in a matrix in a state with rows or columns having a predetermined number width, according to the structure of the specified combining substances, mixing the dispensed elements of substances into the group of the group of the columns accommodating the carriers, with the elements of substances arranged in rows or columns having a predetermined number width, in such a manner that row-like or column-like arrangements of the dispensed elements of substances are positioned against the row-like or column-like arrangements of the elements of substances in a state of transposition or non-transposition.